

Jumping Jamboree!

Brief Overview:

Students will apply their knowledge of time, problem solving, and teamwork in a jumping experiment. This experiment is a jumping competition involving a jump rope and a hula-hoop. The students will work together as teams to determine which piece of equipment is best suited for jumping. They will apply what they have learned by composing a letter to the principal explaining the data they collected.

NCTM 2000 Principles for School Mathematics:

- . **Equity:** Excellence in mathematics education requires equity - high expectations and strong support for all students.
- . **Curriculum:** A curriculum is more than a collection of activities: it must be coherent, focused on important mathematics, and well articulated across the grades.
- . **Teaching:** Effective mathematics teaching requires understanding what students know and need to learn and then challenging and supporting them to learn it well.
- . **Learning:** Students must learn mathematics with understanding, actively building new knowledge from experience and prior knowledge.
- . **Assessment:** Assessment should support the learning of important mathematics and furnish useful information to both teachers and students.
- . **Technology:** Technology is essential in teaching and learning mathematics; it influences the mathematics that is taught and enhances students' learning.

Links to NCTM 2000 Standards:

. **Content Standards**

. **Number and Operations**

Students use numbers to represent measurements of time, length, or counts.

. **Algebra**

- . Use mathematical models to represent and understand quantitative relationships; and model problem situations with objects and use presentations such as graphs, tables, and equations to draw conclusions.
- . Analyze change in various contexts; investigate how a change in one variable relates to a change in a second variable; and identify and describe situations with constant or varying rate of change and compare them.

Data Analysis and Probability

- . Formulate questions that can be addressed with data and collect, organize and display relevant data to answer them; collect data using observations, surveys, and experiments; and represents data using tables and graphs such as: line plots, bar graphs, and line graphs.
- . Select and use appropriate statistical methods to analyze data; describe the shape and important features of a set of data and compare related data sets, with an emphasis on how data are distributed; use measure of center, focusing on the median and understand what each does and does not indicate about the data set; and compare different representations of the same data and evaluate how well each representation shows important aspects of the data.
- . Develop and evaluate inferences and predictions that are based on data; and propose and justify conclusions and predictions that are based on data and design studies to further investigate the conclusions or predictions.
- . Understand and apply basic concepts of probability; describe events as likely or unlikely and discuss that degree of likelihood using such words as certain, equally likely and impossible; predict the probability of outcomes of simple experiments and test the predictions; and understand that the measure of the likelihood of an event can be represented by a number from 0 to 1.

Process Standards

Problem Solving

- . Instructional programs from pre-kindergarten through grade 12 should enable all students to build new mathematical knowledge through problem solving; solve problems that arise in mathematics and in other contexts; apply and adapt a variety of appropriate strategies to solve problems; and monitor and reflect on the process of mathematical problem solving.

Reasoning and Proof

- . Instructional programs from pre-kindergarten through grade 12 should enable all students to recognize reasoning and proof as fundamental aspects of mathematics; make and investigate mathematical conjectures; develop and evaluate mathematical arguments and proofs; and select and use various types of reasoning and methods of proof.

Communication

- . Instructional programs from pre-kindergarten through grade 12 should enable all students to organize and consolidate their mathematical thinking through communication; communicate their mathematical thinking coherently and clearly to peers, teachers, and others; analyze and evaluate the mathematical thinking and strategies of others; and the language of mathematics to express mathematical ideas precisely.

Connections

- . Instructional programs from pre-kindergarten through grade 12 should enable all students to recognize and use connections among mathematical ideas; understand how mathematical ideas

interconnect and build on one another to produce a coherent whole; and recognize and apply mathematics in context outside of mathematics.

Representation

- . Instructional programs from pre-kindergarten through grade 12 should enable all students to create and use representations to organize, record, and communicate mathematical ideas; select, apply, and translate among mathematical representations to solve problems; and use representations to model and interpret physical, social, and mathematical phenomena.

Links to National Science Education Standards:

- . **Science as Inquiry**
Students will develop explanations for projected theories and for actual observations through the use of data collection methods.

Grade/Level:

Grades 3 - 5

Duration/Length:

Three days

Prerequisite Knowledge:

Students should have working knowledge of the following skills:

- . Time concepts
- . How to use a stopwatch
- . Tallying data
- . Constructing a bar graph with all elements present
- . Use of complete sentences to create written responses
- . Using a rubric to evaluate writing

Student Outcomes:

Students will be able to:

- . Conduct an experiment involving hula-hoops and jump ropes for a jumping competition.
- . Collect and record data collected on a tally chart.
- . Construct a bar graph with all of the correct graphing components.
- . Interpret and describe information orally and written from a graph or table.
- . Compose a friendly letter that explains the data collected.

Materials/Resources/Printed Materials:

- . 1 jump rope per group
- . 1 hula-hoop per group
- . 1 large ball per group
- . 1 smaller sized rubber ball per group (or slightly smaller)
- . 1 stopwatch per group or one stopwatch for teacher
- . Overhead projector
- . Student resource sheets for each student or group
- . Teacher resource transparencies
- . Teacher resource sheets
- . Pencils and crayons for each student
- . Lined notebook paper
- . 1 prepared clipboard with Student Resource Sheets # 1 and 2 attached per group

Development/Procedures:**Day 1****Motivation**

Show students a large ball and a small ball of different make. Ask students which ball they think they can bounce the most in one minute. Take predictions on a chart on the chalkboard.

Activity

1. Have a student volunteer to bounce the large ball while the teacher keeps time using a stopwatch. Let students count the bounces. Record the data on the overhead (Teacher Resource Sheet # 1). Repeat the procedure using a small rubber ball. Record the data. Repeat this two additional times with different students.
2. Examine the data on the overhead with the students.
3. As a class, create a bar graph that displays the information from the data sheet (Teacher Resource Sheet # 2). Review graphing rubric with class (Teacher Resource Sheet # 3).
4. After plotting all of the information on the graph, analyze it with the students.
5. Discuss which ball was bounced the most in one minute and why.
6. Discuss what factors or variables might have affected the number of bounces.
7. Display vignette on overhead and discuss (Teacher Resource Sheet # 4).

Day 2

1. Re-display vignette on the overhead and discuss. (Teacher Resource Sheet # 4)
2. Place students in cooperative groups of four (depending on class size).
3. Discuss with students the procedure for conducting the experiment.
4. Give each student in the group a job (Timekeeper, Data Recorder, Hula Jumper, Rope Jumper) At teacher discretion, you may want to create nametags or badges for students.
5. Distribute clipboards with Student Resource Sheets # 1 and 2 to each group of students. Have groups write their name or group number on the paper. Read and explain directions.
6. Distribute the rest of the materials needed for the experiment to each group.
7. Allow 20 – 30 minutes for student groups to perform the experiment. Rotate among groups to offer assistance. (For ample space, the experiment might be best conducted outside.)
8. Once each group has done three trials for each piece of equipment and all of the data has been recorded, return to the classroom. Collect all materials except Student Resource Sheets # 1 and 2.
9. Allow time for students to review the data collected on their resource sheets in their groups and complete any unfinished questions.
10. Review graphing rubric. (Teacher Resource Sheet # 3)
11. After reviewing graphing rubric, distribute crayons.
12. Give student groups 10 minutes to transfer data from the data chart to a. (Student Resource Sheet # 2. Students may use two colors to show the comparative data on the graph.)
13. Have a class discussion about the results of each group.
14. Collect Student Resource Sheets 1 and 2 from student groups and save until the next day.
15. Teacher will review data sheet independently in order to know who won the competition.

Day 3

1. Return Student Resource Sheets # 1 and 2 from previous day to student groups. Review vignette.
2. Discuss the data each group recorded. (i.e., which item was easier to jump with and why)
3. Distribute one copy per group of graphing rubric. (Teacher Resource Sheet # 3).
4. Teacher will construct a bar graph with the class that shows the most hulas jumps per jumper in one minute (using a transparency of Teacher Resource Sheet # 2). Ask students to provide their data about the number of jumps. Record on the bar graph. Analyze and discuss.
5. Teacher will construct a bar graph with the class that shows the most rope jumps per jumper in one minute (by creating a transparency of Teacher Resource Sheet # 2). Ask students to provide their data about the number of jumps. Record on the bar graph. Analyze and discuss.
6. Compare data from bar graph from step 5 and step 6. Ask:
 - . Which piece of equipment worked best? Why?
 - . Which team completed the most number of jumps in one minute?
 - . Which team completed the least number of jumps in one minute?(teacher may generate more questions if needed)
7. Display the total results data table (Teacher Resource Sheet # 5).
8. Distribute lined writing paper to each student in the class. Display the vignette on the overhead, Teacher Resource Sheet # 4, and have students preview the activity independently.
9. The teacher will then review the task on the overhead with the students.
10. Distribute Individual Questionnaire (Student Resource Sheet # 3) to students. Give them 15 minutes to complete.
11. Review the rubric for a letter to the principal (Teacher Resource Sheet # 6).
12. Allow the students 10 minutes to organize and web ideas on writing paper.
13. Give students 20 minutes to complete the writing prompt.
14. The paragraphs can be shared in a small group or whole group setting for peer evaluation.

15. Discuss the winner of the competition and celebrate! Reward all students for a job well done.

Performance Assessment:

Student learning will be assessed throughout the daily tasks and scored using rubrics.

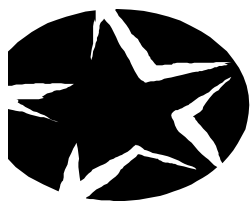
Extension/Follow Up:

- . Conduct the experiment with another class. Compare the data from both classes.
- . Plot the results on the school web page.
- . Use different types of ropes and hula-hoops to conduct the experiment
- . Have students add their total rope and hula jumps in order to construct a line plot of total jumps for each student. Record the data on the line plot. (Create a transparency of Teacher Resource Sheet # 5c.) Analyze and discuss.

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Data Tally Sheet

Use this sheet to record the number of times the ball bounces in one minute. One student will use the stopwatch for the timing portion. The second student will collect the data by counting each bounce. Taking turns, one person will bounce each ball. You will fill out the information below. But first, make a prediction...

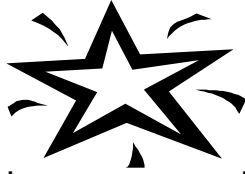
Which ball do you think you can bounce the most? _____

Explain your prediction. _____

	Trial 1	Trial 2	Trial 3	Total
Rubber Ball				
Basketball				

Was your prediction true or false? _____

Explain what really happened. _____



Bar Graph

To show your results of your experiment, record each outcome of each trial.



***PLACE YOUR
KEY HERE:***

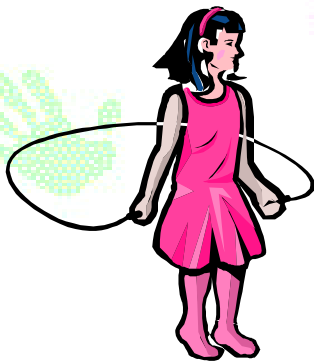


Explain the data on the graph. _____

Graphing Rubric

- 4
 - Includes all bar labels.
 - Data is placed properly.
 - Includes accurate scale and spacing.
 - Contains proper spelling.
 - Title included.
 - X and Y axis are labeled.
- 3
 - Graph is missing 1-2 components.
 - Includes little inaccurate scaling and spacing.
 - Contains 1 minor measurement inaccuracy.
 - Contains 1-2 spelling and grammar errors.
- 2
 - Graph is missing up to 5 components.
 - Includes up to 5 scaling, spacing, and measurement inaccuracies.
 - Contains up to 5 improper spelling errors.
- 1
 - Graph is missing up to 5 components.
 - Includes more than 5 scaling and spacing inaccuracies.
 - Contains more than 5 errors.
- 0
 - No performance.

Vignette



A jumping competition is coming to school. Your task is to determine which piece of equipment is best suited for jumping – a

hula-hoop or a jump rope. To participate, you must have a group of four people. You will be provided with a jump rope, a hula-



hoop, a stopwatch, and data forms. You will record jumps per minute for each piece of equipment, three times. Using the data that you have collected, you will write a letter to the principal explaining which type of equipment you should use to win the competition.



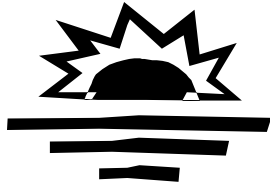
***THESE ARE THE RESULTS
OF THE THREE
CATEGORIES, BASED ON
THE BAR GRAPH.***

	Winners
Category One: Highest amount of jumps with a jump rope.	
Category Two: Highest amount of jumps with a hula-hoop.	



Letter to Principal Rubric

- 4
 - Contains the five parts of a letter.
 - No spelling and grammar errors.
 - Contains an introduction with a topic sentence.
 - Contains 3-4 examples from experiment.
 - Usage of three vocabulary terms related to the experiment.
 - Contains a conclusion.
- 3
 - Contains no more than 3 spelling and grammar errors.
 - Includes 4 of the five parts of a letter.
 - Includes a weak topic sentence and conclusion.
 - Includes usage of two vocabulary terms.
 - Contains two examples from experiment.
- 2
 - Contains 4-5 spelling and grammar errors.
 - Includes 3 of the five parts of a letter.
 - Contains an introduction with no topic sentence.
 - Includes usage of one vocabulary term.
 - Contains one example from experiment.
- 1
 - Contains more than 5 spelling and grammar errors.
 - Includes 2 or less of the five parts of a letter.
 - Contains no introduction or conclusion.
 - No usage of vocabulary terms.
 - Contains no examples from experiment.
- 0
 - No performance



Data Tally Sheet

Use this sheet to record the amount of jumps per minute. You will break into groups of four. Designate one student to be the “Official Data Recorder”. The Recorder’s job is to count each jump and record that amount in the correct column for each trial. Next, designate a student to be the “Official Timer”. The Timer will keep track of each minute on the stopwatch and will tell the participants when to begin jumping. Each of the jumpers will take turns with each piece of equipment. But before your group begins, make a prediction...

Which piece of equipment do you think will produce the most jumps? _____

Explain your prediction. _____

	Trial 1	Trial 2	Trial 3	Total
Jump Rope				
Hula-Hoop				

Was your prediction true or false? _____

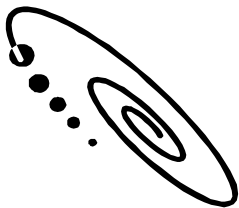
Explain what really happened. _____

Bar Graph

Show your total results of jumps on this bar graph. Include all numbers, keys, and labels to fully explain your data. After the graph is completed, answer the question below. You may use the back of this page for more space.



Place Your
Key Here



Explain the data on the graph. _____

Individual Questionnaire

Complete this worksheet independently. Use the information gathered from the previous two days to complete each question. You may use the back of this page for more space.

1. What does the bar graph for rope jumps tell you about jumping with a jump rope?
2. What does the bar graph for hula-hoop jumps tell you about jumping with a hula-hoop?
3. What might your height have to do with your results?
4. What did you think about the jumping experiment?